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(54) Personal data computer for vehicle monitoring

(57) A personal computer, generally of the type commonly available under the trade name Palm Pilot™ is utilized on a heavy vehicle to obtain information. The information may be analyzed by software provided on the computer. The computer is removed from a docking module on the vehicle and plugged into a docking module at a headquarters base. Data can then be downloaded to the headquarters. At the same time, the headquarters can upload information into the computer which

may be then downloaded into the vehicle when the computer is returned to the vehicle. The information taken from the vehicle to the computer may include trip information such as mileage, state line crossing, etc. The information uploaded into the computer may include trip information which can then provide instructions to a navigation system on the vehicle. Moreover, the system may also provide diagnostic analyses while on the vehicle.

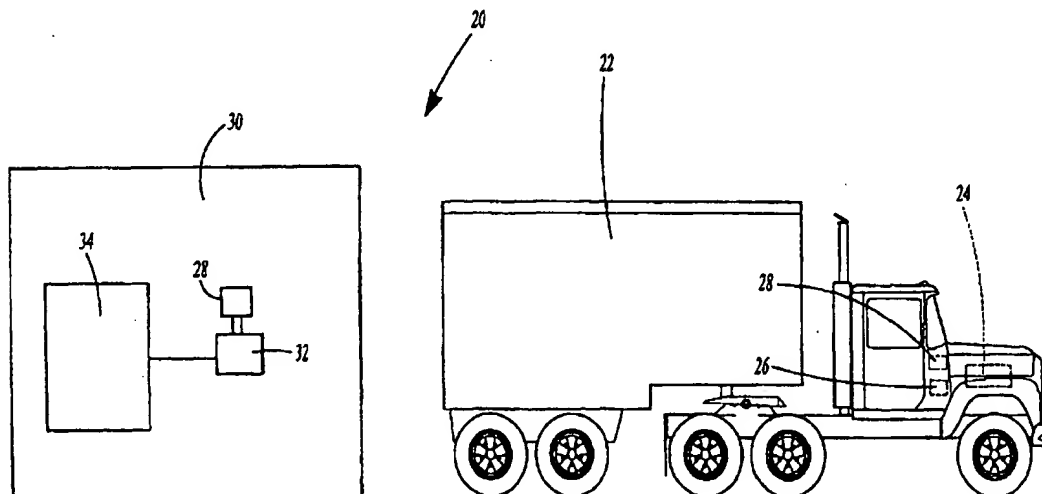


Fig-1

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## Description

### BACKGROUND OF THE INVENTION

[0001] This invention relates to the use of a personal computer which is selectively plugged into a vehicle, and into a base facility to selectively gather, analyze and transmit data. Heavy vehicles such as trucks, typically require a good deal of data storage and gathering. In particular, on a typical heavy truck trip, the driver must gather a good deal of information with regard to the route traveled. As an example, taxes must be assessed based on the number of state lines crossed, etc. Thus, it is typically necessary for a truck driver to prepare detailed manual logs during or after a trip.

[0002] It would also be desirable to have a system which monitors and analyzes variables during the operation of the vehicle. As an example, it would be desirable to be able to monitor the number of hours driven by an operator, such that an operator is not allowed to drive for too many hours. Moreover, it would be desirable to have a system that can monitor variables such as anomalies in the operation of the vehicle, and analyze such anomalies.

[0003] On-board computers are known for vehicles. However, these on-board computers are typically dedicated into the control system for the vehicle. Moreover, the system is relatively expensive in that hardware and software must be individually tailored for the particular vehicle. Many heavy vehicles are manufactured in relatively low runs, and thus, it may not be cost effective to prepare individual computers.

[0004] More recently, the assignee of the present invention has proposed a system wherein a so-called "Smart Card" stores information during operation of a vehicle, and may then be taken from the vehicle. This card is able to store information with regard to the vehicle, and with regard to the operator operating the vehicle. While this Smart Card does provide many functional benefits, it is not able to perform any computations on the gathered data.

[0005] It would be desirable to develop a system which can not only gather, but also analyze and respond to the gathered data.

### SUMMARY OF THE INVENTION

[0006] In the enclosed embodiment of this invention, a removable personal data assistant (PDA) or computer, is docked in a docking station on the vehicle. The PDA gathers operational information from the vehicle. When the driver leaves the vehicle the PDA can be taken with the operator and brought to a headquarters facility. In this way, it is relatively simple to download operational information from the vehicle to the headquarters. Further, the headquarters can upload information into the PDA which can then be transmitted to the vehicle when the driver returns to the vehicle.

[0007] Among the types of information which may be gathered and stored by the PDA includes operational information such as driver identification, trip information, operational history for the driver, etc. Moreover, the information which has typically been stored in manual logs by the operator can be simply stored on the computer. As an example, the number of state lines crossed, etc., may be stored.

[0008] Moreover, the computer is able to analyze and/or store information from the vehicle during operation of the vehicle to look for anomalies. As an example, a number of particular conditions may be sensed by the computer which would be indicative of a particular problem. The computer may then send a diagnostic signal which will enable the problem to be further identified.

[0009] In a most preferred embodiment, an off-the-shelf computer may be utilized. In this way, no expensive hardware or software need be developed. One such PDA is typically known and available under the trade name Palm Pilot™. Such a PDA is easily tailored to include additional software such that the headquarters can program the PDA to include particular software for any particular function the headquarters would like be performed at the vehicle. Again, the use of this system simplifies and facilitates the gathering of data from the vehicle.

[0010] These and other features of the present invention can be best understood from the following specification and drawings, the following which is a brief description.

### BRIEF DESCRIPTION OF THE DRAWINGS

#### [0011]

Figure 1 schematically shows a headquarters and vehicle.

Figure 2 is a schematic view of the PDA mounted in a vehicle.

Figure 3 is a flow chart showing the invention.

### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0012] Figure 1 is a schematic view of a system incorporating a heavy vehicle 22 with an onboard computer or controller 24. Computer 24 communicates through a bus line with a docking module 26. A removable computer 28 is plugged into the docking module 26.

[0013] A remote headquarters 30 also includes a docking module or base 32 to receive the removable computer 28. The docking module 32 communicates with a headquarters computer 34.

[0014] As shown in Figure 2, the computer 24 receives operational information from a number of on-board devices 40, 42, 44. Thus, operational information is transferred through the data bus, into the module 26, and then to the removable computer 28. Among the in-

formation received by the computer 28 is distance traveled, location, navigation system information, etc. The removable computer 28 calculates information applicable for taxes such as fuel taxes, and taxes based on crossing a state line. The software provided on the removable computer 28 is appropriate for receiving the information and calculating the required taxes.

[0015] Moreover, the removable computer 28 may be provided with the ability to analyze anomalies in the information transferred over the data bus. As an example, if a particular anomaly is indicative of a problem with one of the components 40, 42, or 44 the computer 28 may send a signal which will assist in diagnosing which components is experiencing a failure. That diagnosis is then stored at the computer 28, or a signal can be sent. When the removable computer 28 is next loaded into the docking module 32 at headquarters, the computer may then download the operational information with regard to the failing component. A worker in this art would understand the signals, etc. that would provide such diagnostic functions.

[0016] Updated software, or additional information with regard to the driver, the trip, etc., may be uploaded from the headquarters computer 34 into the removable computer 28. In this way, chip information, or updated information with regard to what the company would like to be monitored can be uploaded into the computer 24 on an ongoing basis. A navigation system which may be one of the components 40, 42 or 44 may be associated with the onboard computer 24, and provide detailed trip information to removable computer 28. Further, trip information could be uploaded from the headquarters into the vehicle, and would then communication with the navigation system. Again, the provision of a removable computer 28 which is relatively inexpensive thus provides valuable benefits.

[0017] Further, while plugged into either module 32 or 26, the computer is being recharged.

[0018] Figure 3 is a flow chart for an invention utilizing the removable computer 28 into a vehicle. First, the computer 28 is plugged into a vehicle. It begins to receive information and/or transmit information. Information received may be analyzed for purposes of calculating required taxes. Further, information may be outputted to the vehicle as in the diagnostic information as mentioned above.

[0019] Finally, the removable computer may be unplugged from the vehicle and plugged into a terminal at headquarters. At that time data may be downloaded, while other information may be uploaded.

[0020] While preferred embodiments of this invention have been disclosed, a worker in this art would recognize that many modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.

## Claims

1. A method of gathering and analyzing data from operation of a vehicle (22) comprising the steps of:
  - (i) providing a first docking module (26) on a vehicle, and a second docking module (32) at a remote location (70);
  - (ii) plugging a removable computer (28) into said first docking module on the vehicle and operating said vehicle;
  - (iii) storing information from operation of the vehicle on said removable computer, and analysing said information; and
  - (iv) removing said removable computer from said first docking module on said vehicle and plugging said removable computer into said docking module at said remote location.
2. A method as recited in Claim 1, wherein among the analyses made is calculating taxes required for operation of said vehicle.
3. A method as recited in Claim 2 wherein the removable computer processes data supplied by one or more onboard devices (40, 42, 44) on said vehicle so as to calculate said taxes.
4. A method as recited in any preceding Claim wherein information is uploaded into said removable computer when docked into said second docking module at said remote location, and said information is downloaded into said vehicle when said removable computer is docked into said first docking module.
5. A method as recited in Claim 4, wherein trip information and/or driver information is uploaded into said removable computer and then downloaded into said vehicle.
6. A method as recited in any preceding Claim, wherein said removable computer analyses operational information and identified anomalies, and then sends control signals to a vehicle controller while docked on said vehicle.
7. A method as recited in Claim 6, wherein the removable computer sends a signal to assist in diagnosing said anomaly, and/or interrogates the vehicle control to assist in diagnosis and/or analysis.
8. A method as recited in Claim 6 or Claim 7, wherein said operational information is at least one of location data, navigational data, data related to passing a State Line, and/or distance data.
9. A method as recited in any preceding Claim, wherein trip information is downloaded from said vehicle

into said computer during step (ii).

10. A method as recited in any preceding Claim, wherein the removable computer may be programmed so as to store and analyse differing data for differing drivers of said vehicle. 5
11. A system (20) for monitoring operation of a vehicle (22) comprising: 10
- A vehicle (22) including a docking module and a computer;
- A headquarters (30) having a docking module (32); and
- A removable computer (28) which may be plugged into said docking module at said headquarters and said docking module on said vehicle, said computer obtaining data from said vehicle during operation of said vehicle, and downloading said data to said headquarters when removed from said vehicle. 15 20
12. A system as set forth in Claim 10, wherein said headquarters also uploads information into said computer to be downloaded into said vehicle. 25

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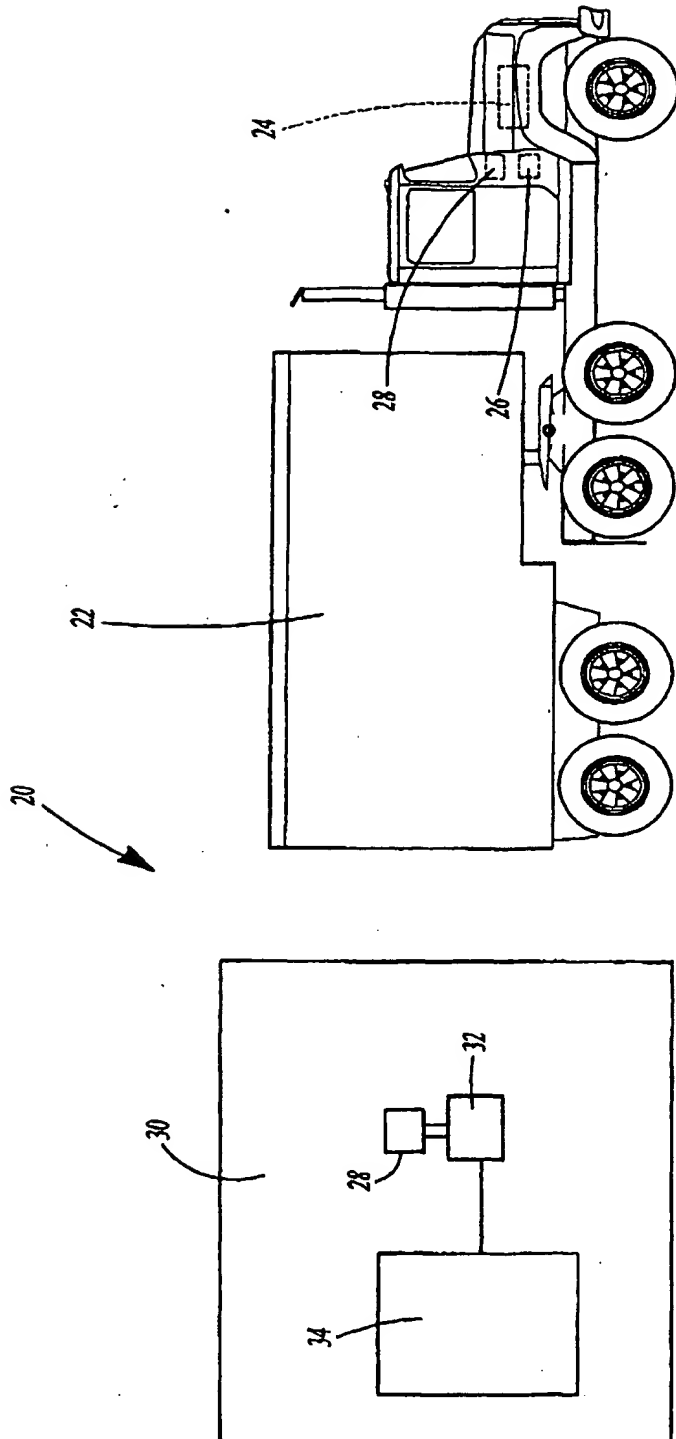


Fig-1

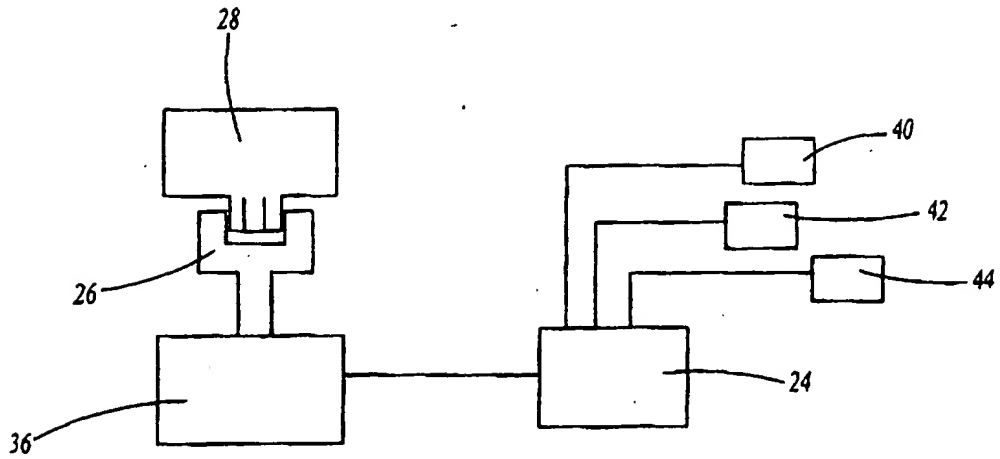


Fig-2

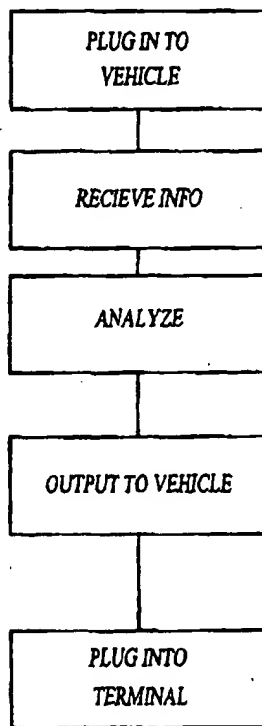


Fig-3